

*ENVIRONMENTAL ASSESSMENT  
OF THE  
OPERATION AND MAINTENANCE  
OF*

**UNION VILLAGE DAM**  
*OMPOMPAÑOOSUC RIVER*  
**THETFORD, VERMONT**

*Prepared by*



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## PREFACE

The purpose of this Environmental Assessment is to provide the basis for evaluation of the environmental impact on the project area due to the routine operation and maintenance of this flood control reservoir. Union Village Dam has been operated whenever necessary since it was constructed to prevent or reduce downstream flooding. Maintenance and management of the project, including the recreation facilities, during non-flood periods is also of primary importance. Enhancement of the fish and wildlife resources as well as protection of the environment within and around the reservoir area has been given careful consideration.

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## I. PROJECT DESCRIPTION

### A. INTRODUCTION

#### 1. Location and Authorization

Union Village Dam, the New England Division's northernmost flood control project, is located on the Ompompanoosuc River, 4 miles above its junction with the Connecticut River, within the town of Thetford, Vermont. The project is one-fourth mile north of Union Village and 11 miles north of White River Junction, Vermont. Union Village Dam was authorized by the Flood Control Acts of 1936 as amended, and 1938 (House Document 445, 75th Congress, 2nd Session). Construction was completed in June 1950 at an estimated cost of \$4,072,000 including the provision of public use facilities.

#### 2. Purpose

The project, together with other units in the comprehensive plan for flood protection and other purposes in the Connecticut River Basin, provides flood protection for potential downstream damage centers along the Connecticut River in Vermont, New Hampshire, Massachusetts and Connecticut.

### B. STRUCTURES AND RESERVOIR

#### 1. Dam

Union Village Dam is a rolled-earth fill embankment with rock slope protection. It has a length of 1,100 feet, a top width of 30 feet and a maximum height above the river bed of 170 feet. The top elevation at 584 feet above mean sea level (msl) is 20 feet above spillway crest.

## 2. Spillway and Outlet Works

A chute spillway built in rock is located on the west abutment of the dam with the approach channel floor at about elevation 520 feet msl. The crest of the ogee-shaped spillway is 388 feet long and is at elevation 564 feet msl. Flows are returned through an 1,100 foot long discharge channel to Avery Brook, thence another 1,100 feet to the Ompompanoosuc River.

The outlet works consist of an approach channel, intake structure, discharge conduit and discharge channel. The intake channel is about 394 feet long, 23 feet wide, and has an invert at elevation 420.0 feet msl. The concrete intake structure houses the equipment to operate the two 7'6" x 12'0" broome gates. These gates regulate the discharge through the 13'0" diameter, 1,236 foot long discharge conduit. The rock cut and earth discharge channel is 60 feet wide and approximately 640 feet long.

## 3. Reservoir

The reservoir, when filled to spillway crest elevation, has a total capacity of 38,000 acre-feet, a surface area of 740 acres, and a length of 3.5 miles, extending upstream on the main branch and the West Branch of the Ompompanoosuc River. During the nonfreezing season, both gates normally are open 3 feet to pass the normal river flow with the reservoir dry. A small winter pool is maintained to protect the gates from freezing. This approximately 45 acre pool at elevation 440 feet msl has a water depth of approximately 20 feet and a volume



of 400 acre-feet. The 38,000 acre-feet of maximum reservoir storage is equivalent to 5.65 inches of runoff from the 126-square mile drainage area.

The Union Village project area consists of 1,292 acres of land acquired in fee and 4 acres with flowage easement rights.

#### C. OPERATION PROCEDURES

##### 1. General

Union Village reservoir is normally empty in nonflood periods as river flows pass unimpeded through the dam. The winter operational pool is maintained from late fall to early spring, after which it is lowered to recover full flood storage capacity for the spring high runoff season.

All reservoir operations are preceded by communications with, and instructions from the Corps' Reservoir Control Center (RCC) in Waltham, Massachusetts. The Project Manager will immediately notify RCC whenever any of the following conditions occur: (1) one inch of precipitation at the dam or any precipitation station within the network; (2) a rising pool reaches a stage of 10 feet or a rising winter pool reaches a stage of 25 feet; (3) the Connecticut River at Wells River rises to a stage of 7.5 feet, or the stage at White River Junction rises to 14 feet, or the stage at West Hartford on the White River rises to 10 feet; and (4) unusual local conditions such as difficulty with the gates, ice jams, excessive debris, bridge failures, etc.



## 2. Flood Regulation

Regulation may be considered in three phases during the course of a flood: Phase I, the appraisal of storm and river conditions during the development of the flood leading to the initial regulation; Phase II, regulation while the Connecticut River flood flows crest and move downstream; and Phase III, emptying the reservoir following the downstream recession of the flood.

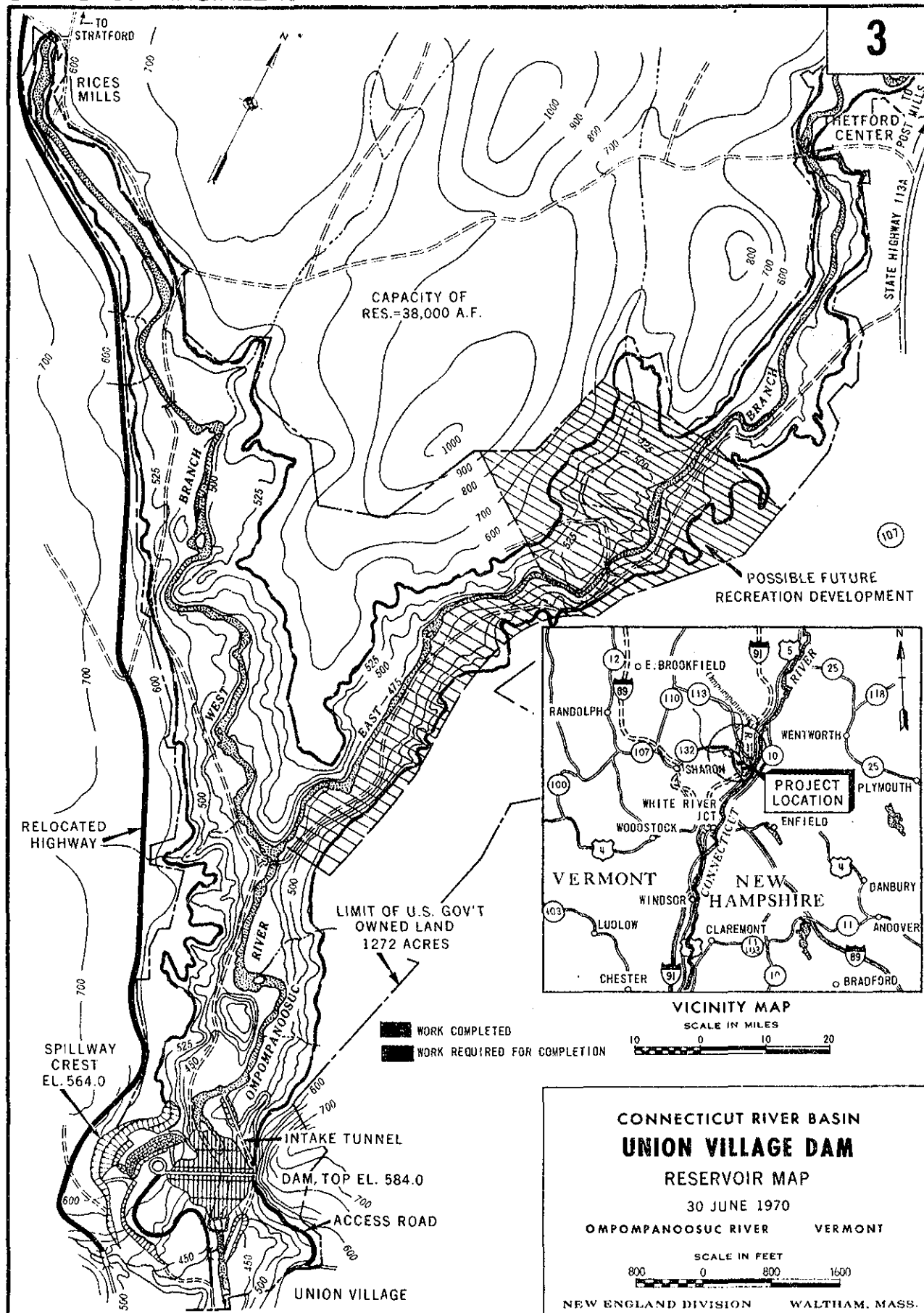
## 3. Cooperation with Downstream Water Users

It is the policy of the Corps of Engineers to cooperate whenever possible with downstream water users and other interested parties or agencies. The Project Manager may be requested by downstream users to deviate from normal regulations for short periods of time. Whenever a request for such modification is received, the Project Manager will ascertain the validity of the request and obtain assurance from other downstream water users that they are agreeable to the proposed operation. He will then relay the information to the RCC and request instructions. During reservoir operations the minimum discharge is about 10 cfs, which is required for downstream fish life.

## D. MANAGEMENT PROGRAMS

Project personnel at Union Village Dam have carried out a continuing reforestation program on lands near the dam site that were cleared during project construction. The Vermont Fish and Game Department stocks rainbow trout and brown trout in the main stem and the West Branch of the Ompompanoosuc River. The Corps of Engineers manages three small picnic sites within the reservoir area along the Ompompanoosuc River, as well as one picnic site downstream of the dam.

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## II. ENVIRONMENTAL SETTING

### A. DESCRIPTION OF GENERAL AREA

#### 1. Climate and Precipitation

The Ompompanoosuc River watershed has a variable climate characterized by frequent but generally short periods of heavy precipitation in the summer and longer periods of less intense precipitation in the winter months. It lies in the path of the "prevailing westerlies" and cyclonic storms that move across the country from the west or southwest. The area is also exposed to coastal storms, locally known as "northeasters," that travel up the Atlantic seaboard. In addition, tropical hurricanes constitute an infrequent but important potential for flood-producing precipitation, particularly from August through October. Thunderstorms may occur over the basin at any time of year and may be of local origin or associated with a stationary front.

Winters are moderately severe with subzero temperatures being common; summers are mild with temperatures over 90 degrees being infrequent. The average annual temperature of the Ompompanoosuc River watershed is about 42°F. Average monthly temperatures vary widely throughout the year, from 16°F. in January to about 67°F. in July. Extremes in temperature range from a high of 100°F. to a low of -40°F.

The mean annual precipitation over the basin for 81 years of record, through 1968, is about 36 inches distributed rather uniformly throughout the year. Average monthly precipitation at Chelsea, located about 16 miles north of the Union Village Dam, ranges from a minimum of 2.37 inches in February to a maximum of 3.58 inches in July. Extremes in precipitation vary from a minimum recorded value of 0.13 inches in October to a maximum of 10.86 inches in November. The mean annual snowfall for 71 years of record at Chelsea, Vermont is 87.7 inches with about 45 percent of this amount occurring in the months of January and February. Moderately high springtime discharges frequently occur as a result of melting snow, but runoff from this source alone, during the period of record, has not caused a major flood. Serious flooding due to a combination of heavy rain and snowmelt, however, is a possibility nearly every year.

The mean annual runoff from the drainage area above Union Village Dam represents about 55 percent of the mean annual precipitation. About 60 percent of the runoff occurs in the months of March, April and May. Usually, the maximum monthly runoff in every year occurs during the snowmelt months of March and April.

## 2. Topography

The Ompompanoosuc River watershed is located in east central Vermont, primarily in Orange County with only a small portion at the mouth of the river in Windsor County. The watershed is roughly fan-shaped, about 17 miles long and 12 miles wide with a drainage area

of 126 square miles, all but 10 of which lie upstream of Union Village Dam.

The terrain in the watershed is steep and conducive to rapid runoff in a southeasterly direction. Elevations vary from over 2,300 feet msl in the northwestern headwaters to 385 feet msl at the river's mouth with an average watershed elevation of about 1,300 feet. The Y-shaped reservoir is confined in the narrow valleys of the West Branch and Ompompanoosuc Rivers. Elevations in the vicinity of the project range from about 420 feet msl to more than 1,200 feet msl atop The Glebe which flanks the Ompompanoosuc valley northeast of the dam.

### 3. Vegetative Cover Types

The forest vegetation of the Ompompanoosuc watershed is characterized by the major association of white pine, eastern hemlock, sugar maple, American beech, and yellow birch. Other species found in the reservoir area are tamarack, gray birch, flowering dogwood, red and silver maple, red oak and numerous other hardwoods and shrubs interspersed among the more predominant species. About 200 acres of Federally owned land within and adjacent to the reservoir are maintained as pasture and leased to a local farmer.

### 4. Fish and Wildlife Species Present

The Ompompanoosuc River and its tributaries support both warm and cold water fisheries. Trout, principally brook and some brown, are generally found throughout the cold streams of the basin. Natural

reproduction and an annual stocking program maintain a good population of trout in the region. Warm water fish are found in that stretch of the main branch south of Post Mills which receives natural outflows from Lake Fairlee, in the lake itself, and at the extreme lower end of the Ompompanoosuc River downstream from Union Vallage Dam. Species found in these warmer waters include smallmouth bass, largemouth bass, yellow perch, pickerel and bullheads, along with dace, sculpin, suckers, shiners, rock bass and burbot.

Wildlife species in the area are typically those of the foothills of the Green Mountains. They include a few black bears, an abundant deer population, and a variety of small game and fur-bearing species including beaver, snowshoe hare, otter, mink, rabbit, raccoon, gray squirrel, fox, skunk, and muskrat. Game birds in the area are principally of the upland variety and include ruffed grouse and woodcock.

#### 5. Geologic Features

The area is typical of much of the upland New England physiographic province inasmuch as it displays the character of an ancient plateau dissected by narrow V-shaped valleys. Remnants of the plateau (at an average elevation of 1500 feet msl) are underlain by crystalline igneous and metamorphic rocks and the valleys are lines with sands and gravels of glacial and more recent fluvial origin. Exploitation of some minerals, principally copper, has occurred in the past and, most recently, during and after World War II at scattered localities in the general region, but the deposits are now considered submarginal at best.

## 6. Historical and Archeological Features

At Thetford Hill, two miles northeast of the Union Village Dam and less than a mile east of the reservoir area, is the Old Congregational Church, built in 1787, the oldest church in Vermont in continuous use since construction. This site of the church is on the edge of the Ompompanoosuc drainage basin.

Archeologists have reported an Indian burying ground about 1000 feet north of the mouth of the Ompompanoosuc along the west shore of the Connecticut River. Also, an Indian petroglyph on a boulder has been found in Strafford near an old mill close to the site of an abandoned copper mine. Both of these sites are in areas not affected by impoundment at Union Village Dam.

## 7. Socioeconomic Conditions

Orange County, in the southeast corner of which is the township of Thetford, is a sparsely populated region, averaging about 25 persons per square mile. Its economy is dominated by agriculture and so no strong economic centers of influence exist. The economic influences on the project area are exerted mainly by White River Junction, VT., Lebanon and Hanover, New Hampshire and a lesser extent, Barre and Montpelier, VT. Two interstate highways, I-91 a few miles to the east and I-89, 12 miles to the southwest, provide good access to the area.

The population of Orange County in 1970 was 17,676 persons, less than in 1820. The county's population is now estimated to be growing

at an annual rate of 0.5 percent per year. Population in the Ompompanoosuc River watershed in 1970 was 3,288 persons, up from 2,909 in 1960. But as recently as 1940, population of the basin was greater than it now is. The township of Thetford has a population of 1,422 persons in 1970, up from 1,046 and 1,049 in 1950 and 1960 respectively. Commuting facilities, state land use policies, tax programs, and other varying external influences will continue to be important determining factors of future growth in Thetford.

Topography, a limiting factor for both the mobility of inhabitants and selection of sites, has dampened industrial development in the county. Of the approximately 6,600 employable inhabitants of the county, about 20 percent are estimated to be employed in manufacturing industry (largely outside of Orange County), about 13 percent in agriculture or forestry, and about 10 percent in the construction industry. About 25 percent of the labor force is in seasonal summer employment, principally because of camps for children which are on some of the nearby lakes. A statewide survey conducted in 1969, however, ranks Orange County as the lowest in Vermont in "effective buying income" per household.



### III. THE ENVIRONMENTAL IMPACT OF THE OPERATION, MAINTENANCE AND MANAGEMENT PROGRAM

#### A. OPERATION OF PROJECT FOR AUTHORIZED PURPOSES

##### 1. Downstream Effects - Regulation of Flows and Releases

##### a. Flooding Prevented

Union Village Dam is four miles upstream from the junction of the Ompompanoosuc River with the Connecticut River. Its principal function is to serve as one structural unit in the comprehensive plan for flood control in the Connecticut River Basin; it also protects the few property owners downstream on the Ompompanoosuc from flood hazards. The four-mile stretch of the Ompompanoosuc River Valley downstream from the dam is rural and rather sparsely populated with small farms.

Since Union Village Dam was completed in 1950 there have been 27 significant storage operations and the Corps has estimated that damages prevented from 1950 to 1972 amount to \$1,402,000. The bulk of these "damages prevented," is assigned to downstream reaches of the main stem of the Connecticut River. In the most recent flood of June-July 1973, operation of Union Village Dam resulted in about a six-foot reduction of the Ompompanoosuc River flood stage, and a stage reduction of 1.5 feet on the Connecticut River at White River Junction, Vermont. Union Village Dam's contribution to reducing flood stages at all downstream locations is analyzed in calculating "damages prevented" and attributing them specifically to the project.

b. Fish and Wildlife

The regulation of flows and releases at Union Village Dam has some slight but unmeasured effects on downstream fish and wildlife.

Normally, the Ompompanoosuc River flows unimpeded through Union Village Dam and flow regulation is infrequent, except for the maintenance of a small pool during winter months. Flood control operations take place most often in March, April and May but may occur in any month. Since evacuation of stored flood water commences as soon and as rapidly as possible following recession of a flood, water quality problems such as oxygen depletion, which might accompany more prolonged storage, do not develop. It is doubtful that reproduction of fish or other aquatic organisms is significantly affected during the short time when a flood control operation takes place. The non-damaging channel capacity downstream from the dam is relatively high, so that controlled releases are usually sufficient to prevent excessive buildup of silt and sediments in the stream bed.

c. Vegetative Cover and Timber

The Ompompanoosuc River channel below the dam is narrow and well defined. Because releases have been and are restricted to the channel capacity of 2100 cfs whenever possible, downstream effects on vegetation have been minimal. Most of the limited flood plain area between the dam and the Connecticut River is either used for pasture and hayfields or is wooded. Agricultural and grazing uses may benefit

somewhat from operations at Union Village Dam due to the flood protection afforded by the project. Observations of river banks show only normal undercutting as a result of changes in water levels and velocities, and bankside vegetation appears relatively undisturbed by upstream regulation of flood flows.

d. Water Quality

Routine water quality sampling and analysis are conducted by the Corps of Engineers. Data collected by the Corps and the State of Vermont show that dissolved oxygen levels of all samples met the Class B criteria of 6 mg/l during 1973 and 1974. However, during the summer of 1974, the total coliform bacteria level exceeded the Class B maximum of 500 colonies per 100 ml in 30 percent of the samples taken of the water being discharged. These values varied from 1,200 to 8,000 colonies per 100 ml. No samples were obtained upstream of the dam.

Numerous water quality data collected in 1973 and 1974 indicate that standards for several water quality parameters are occasionally exceeded. These include turbidity, pH, conductivity, hardness, chlorides, ammonia, total nitrates, total phosphates, calcium, magnesium, and fluoride. The reasons for these occasional abnormalities have not been investigated. The operation of Union Village Dam has little or no influence on downstream water quality since the reservoir is dry most of the time. Because regulation for flood control has the effect of detaining initial flows and spreading the

controlled discharge over a longer period than would naturally occur, turbid conditions in downstream reaches may also persist longer. However, the adverse effects of such a change are minor and temporary.

e. Recreational Use

Recreational use of the waters downstream from the dam consists basically of fishing. Regulation of flows, inasmuch as it occurs only during times of flooding, has little effect on downstream recreation. It is significant to note that 20 of the 27 significant storage operations at Union Village Dam since 1950 occurred during the months of March, April and May. But, it is also significant that fish found in the waters below the dam are of the same warm water species as are found in the Connecticut River. Little trout fishing, which is heaviest during the spring months, takes place downstream from the dam. Fishing for other species of fish below the dam may be slightly affected by regulating operations at the dam, particularly when flow rates change considerably within a short time, as during release of stored flood water.

2. Upstream Effects - Temporary Inundation

a. Fish and Wildlife

Fisheries managers in the general area place their greatest emphasis on trout. Natural trout reproduction was observed to be excellent on the main branch above Thetford Center and good on the West Branch above South Strafford; both of these reaches are however, above the spillway crest elevation of the dam and therefore do not

suffer from artificially induced water level fluctuations. The waters below South Strafford (West Branch) and Thetford Center (main branch) normally have summer temperatures which are inhospitable to trout but acceptable for warm water species of fish. The adverse effect on these species by temporary inundation is probably minimal. The spawning period for most of the warm water species present occurs after the normal high-runoff season in the spring; it is unlikely that stranding of eggs or fry upon drawdown of a spring flood pool seriously affects fish populations. It is, on the other hand, reasonable to assume that periodic flooding may benefit fish populations by making more food available. Obviously, periodic inundation of streams within the reservoir may produce substantial changes in bottom characteristics and the amount and kind of available cover. In-stream rubble is moved, banks are undercut, and various debris is left behind in the channel following reservoir drawdown.

Direct losses of wildlife due to temporary inundation are probably minor. Because of the rather restricted and narrow nature of the valleys in which the two branches of the Ompompanoosuc flow, high ground is readily accessible in the event of reservoir filling. Closer to the confluence of the two branches and in upstream areas of the reservoir, there are wider floodplains inhabited by beaver, mink, muskrat, otter and some burrowing species. These animals are

most vulnerable to flooding in the spring and summer during the breeding season when the young would be endangered, but mobility at other times prevents serious losses.

The project supports a good white-tail deer population. This suggests that reservoir fluctuations probably do not adversely affect them. Other mobile and wide-ranging wildlife are likewise little inconvenienced by water-level fluctuations in the 740 acres of floodable land.

Of greater concern than direct loss of wildlife by drowning is the modification of habitat and vegetative cover that accompanies recurrent flooding of the reservoir area. The lower area near the dam which is flooded almost every year, has very limited value as wildlife habitat because of the scarcity of good cover and food. Standing dead trees further upstream in the reservoir may be utilized by a variety of birds and other animals and thus be beneficial.

b. Vegetative Cover and Timber

Flooding of the Union Village Reservoir in the summer of 1973 (June 30 - July 1) took a serious toll on much of the timber in the flooded area. A principal cause of this loss was the time of year when flooding occurred: when vegetation was in full leaf and transpiration was at a maximum. Timber stands line the banks of the river and cover many of the adjacent slopes over much of the reservoir. Because many of the trees, especially those of sapling and pole timber sizes, were completely inundated for more than a week by the impounded

waters, they were killed. Vulnerability of trees is a function primarily of the size of those exposed to flooding. The resistance of some species, as compared with others, is also a factor; as a general rule, evergreens are more susceptible than deciduous species. It is estimated, for example, that white pine growing in the reservoir and having a diameter of less than 8 inches suffered 75 percent mortality as a result of the '73 flood.

Siltation, as is apt to occur during periods of rapid runoff, has a concomitant injurious effect on vegetation in the reservoir, principally on brush, grasses and ferns growing in some of the more open areas. Debris also caused damage to some of the vegetation in the emergent marshland found alongside the river channels, compounded by ice damage in December 1973. The result was broken stems of many clumps of alders and other species of low trees and shrubs over extensive areas of the lowest elevations in the reservoir.

Erosion both by current and wave action within the reservoir area has caused some glacial kame terraces, most noticeably near the confluence of the two branches of the river, to become unstable and to slide. These slopes are generally made up of sandy soils. The vegetation growing on such sites is normally not deeply and firmly rooted and is therefore vulnerable to sliding and toppling when the slopes begin to move. Re-establishment of stability for these slopes is difficult, especially if they are subject to recurrent inundation.

Damage to timber and vegetation upstream from the dam during the 1973 flood occurred over an area of 350 acres, or almost half of the 740 acres below spillway crest elevation. Both the summer flood and ice damage in December 1973, caused by freezing and subsequent drawdown of the flood pool, may be considered very unusual events that will probably not recur frequently. It is doubtful, however, that those areas in which tree mortality from inundation has been high will regain forest cover comparable to the lost stands as long as the project remains in operation.

c. Recreational Use

Upstream inundations may occasionally limit access to, and use of, the area by fishermen, especially during the spring months.

Horseback riding, hiking and snowmobiling are little affected by variations in the reservoir's water level. Snowmobiling, a popular recreation activity in this region, is in fact enhanced by the existence of a winter pool near the dam, since this affords additional area to complement the trail system.

The three small picnic sites upstream from the dam are situated in areas subject to inundation. One of these sites, in an open area alongside the main branch of the Ompompanoosuc River, is especially vulnerable to damage and degradation of its surrounding vegetation. Inundation, the presence of flood-carried debris, and the potential safety hazard of decaying limbs on tall trees can detract from the reservoir's recreational appeal.



## B. CONSTRUCTION AND MAINTENANCE OF PROJECT FACILITIES

### 1. Recreational Facilities

No intensive recreational program exists at Union Village Dam. Facilities are presently available at four picnic sites: one just below the dam and three upstream on the main branch of the Ompompanoosuc River. A total of eight picnic tables and fireplaces are located at these four sites, with restrooms and drinking water available at the project office just downstream from the dam.

Access to the area between the forked branches of the Ompompanoosuc is provided by one iron bridge across the West Branch. In addition, a suspended cable bridge enables snowmobilers to cross the main branch of the river. This snowmobile bridge is privately maintained with the permission of the Project Manager.

### 2. Control of Dead Trees and Vegetation

Periodic inundation of timber in the reservoir area has resulted in damage or killing of a considerable number of trees. Besides the aesthetic problem, dead trees in the reservoir increase maintenance responsibilities for the project staff.

Large flood pools have been held for as long as two weeks at least three times since the project was constructed: April 1950, when the reservoir was filled to 38 percent of capacity; April 1969, 53 percent full; and July 1973, 33 percent full. When the reservoir is 50 percent full, approximately 460 acres are flooded. Recurrent inundation has caused damage to the original forest cover and other plant

life in the lowest areas of the reservoir. Inundation has also prevented natural reproduction and thus the reforestation of the flood-affected area by new seedlings. In some cases sprout growth and small trees do become established during periods of nonflooding, but these are usually damaged or killed by subsequent inundations.

### C. MANAGEMENT OF PROJECT LANDS

#### 1. Rules and Regulations

Rules and regulations for projects managed by the Corps, in addition to insuring effective and efficient flood management operations, are also meant to insure the safety and convenience of the visiting public. Negative signs and warnings, nonetheless, have been held to a minimum so that the public may enjoy maximum freedom without unnecessary or arbitrary restraints.

Automobile access to the road running alongside the West and main branches of the reservoir area is generally prevented by barricades during the winter months, after deer hunting season closes. This regulation discourages use of the road as a public thoroughfare. Provision has been made for barricades to be erected along this and other publicly used roads at any time of year when a rising pool in the reservoir is expected.

#### 2. Fish and Wildlife Management

The Vermont Fish and Game Department oversees stocking and management programs within the Ompompanoosuc River drainage basin. However,

that agency has no specific management plan, for either wildlife or fisheries, within the project area.

Warm water species are to be found in the waters draining from Lake Fairlee into the main branch of the Ompompanoosuc above the project area, and also in that reach below the Union Village Dam. Stocking of trout is carried on outside of the project area at a number of upstream locations by both the state and private property owners. The best trout waters in the watershed are upstream from the reservoir.

Although the project area provides habitat for a variety of species of wildlife, some of which are sought by hunters and trappers, there is no specific program for habitat improvement or stocking in the area. Some autumn olive has been planted close to and upstream from the spillway channel, but this has been done as much to insure slope stability as to provide food and cover for game birds.

The absence of specific efforts to manage fisheries and wildlife in the project area has not detracted from either their numbers or diversity. The area remains essentially undisturbed by unnatural stresses, save for the periodic impoundment of flood waters.

### 3. Environmental Effects of General Leasing and Outgrant Program

Almost 200 acres of pasture land and hayfields are leased by the Corps of Engineers to farmers living in the area. This area is mostly on the low rolling ground between the forked branches of the river.

Agricultural utilization of this land for seasonal purposes is important to local farmers and poses no hazard or adverse environmental impact to the project area.

#### 4. Recreational Use and Management

Visitation in the project area is recorded by traffic counters on Reservoir Road (a dirt road along the main branch of the Ompompanoosuc River) and on the paved road leading into the project area from Union Village. These counters are removed during the winter and estimates are substituted for actual counts during this period. Annual visitation over the past seven years has averaged about 100,000. Heaviest use has traditionally been in the months from May through October and the majority of persons visiting the area during that period have visited the Reservoir Road area.

Management activities are generally restricted to those required to maintain the four picnic sites in the project area: keeping picnic tables and fireplaces in repair, removing rubbish found in or near trash barrels, and maintaining the access roads and sites visited by the public.

No program presently exists for supporting and enhancing the present use of the area by hikers, hunters or fishermen, other than care of access roads and other routine maintenance. However, about 11 miles of roads and paths within the Federally owned project lands at Union Village have been designated by the Corps as snowmobile trails.

No environmental impacts due to the recreational activities within the project boundaries have been identified.

#### 5. Forestry Management

Several areas within the project have been planted with red pine. A number of such areas are just upstream and downstream from the spillway where open areas have been planted with seedling trees. At least one older pine plantation is located on the steep slopes east of Reservoir Road where some timberstand improvement work has been undertaken in the past. Project personnel have planted upwards of 4,000 red pine seedlings every spring for several years, concentrating on covering borrow areas and other open land where vegetation was removed during project construction. More of such work, including selective harvesting, could be done.

Removal of dead trees along Reservoir Road is routinely done so as to minimize the hazard and inconvenience to users of this road.

### IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED AS A RESULT OF THE OPERATION AND MAINTENANCE PROGRAM

#### A. FISH AND WILDLIFE - DOWNSTREAM CHANGES

The Union Village reservoir is empty, except during flood periods, and the flows through the dam are normally equivalent to the natural discharge of the Ompompanoosuc River. Occasionally the impoundment of water behind the dam, especially during the spring, adversely affects

fish and wildlife to the extent that these interruptions in flow deny or interfere with seasonal and cyclical changes in habitat and food supply that would accompany natural flows in the absence of regulation.

#### B. WILDLIFE HABITAT - PERIODIC INUNDATION

Periodic inundation of the Union Willage Reservoir may have an adverse, but unmeasured, effect on wildlife habitat. This effect is mostly in the lowland between the forked tributaries of the Ompompanoosuc River, just upstream from the dam. Species most affected are the burrowing animals such as muskrat, rabbit and small rodents. However, the cessation of farming in a portion of the reservoir area has permitted the growth of shrubs and forbs which quickly recover from inundation and provide excellent wildlife cover for many animal species.

#### C. VEGETATIVE COVER AND TIMBER - PERIODIC INUNDATION

As has already been noted, there is a progressive change in the vegetation and plant associations which originally existed in the reservoir area. This has come about because of the occasional impoundment of flood waters which results in the death and destruction of a wide variety of trees and shrubs.

Vegetative cover and species associations will eventually adapt in such a way that only those species which reach maturity in a few years, rather than in a few decades, will be able to flourish and propagate themselves in lower areas of the reservoir. This means that normal

forest types found above the levels reached by flood waters will eventually be excluded from large areas of the reservoir and a rather sharp transitional vegetative zone ringing the reservoir will become established.

#### F. BANK EROSION

Periodic inundation and resultant wave and current action has undercut the slopes of sandy kames and other glacial features found near the confluence of the West Branch and the main branch of the Ompompanoosuc River, causing them to slide. Vegetative cover is destroyed, or disturbed, by these landslides with the result that successive inundations and heavy rainfalls cause rapid erosion periodically. Base-leveling of these topographic features, especially those which are made up of rather loose sands and gravels of glaciofluvial origin, can be expected to proceed at a slow but steady pace for an indefinite time into the future.

Some incised channels elsewhere in the reservoir display evidence of erosion caused by fluctuating water levels. This erosion causes bank-side vegetation to topple into the stream. It also results in gradual broadening of the channels in those places where outcrops of rock do not inhibit such lateral spreading.

A prototype program of slope stabilization is currently being conducted by the Corps of Engineers at North Springfield and North Hartland Dams where similar erosion problems occur. This program is investigating various methods to determine the effectiveness of slope

stabilization measures. Until effective methods are determined, no extensive slope stabilization work will be conducted.

## V. ALTERNATIVES TO THE OPERATION, MAINTENANCE AND MANAGEMENT PROGRAM

### A. DISCONTINUANCE OF AUTHORIZED FLOOD CONTROL OPERATION

The postulation of "no dam" at Union Village is of particular significance to potential damage centers downstream along the main stem of the Connecticut River. Reduced flood stages, due to the modifying influence of existing upstream flood control dams, have been calculated by hydrologists for some of the floods of the past at some of the downstream damage centers. Similar calculations of the specific reduction for which Union Village Dam alone is responsible are not now available. Any such computation, however, would depend either upon the hydrological records obtained from a specific historical flood event with a specific point of origin or focus, or upon a hypothetical flood event which, in a computational sense, generates hydrologically relevant data. Suffice it to say that discontinuance of Union Village Dam as a flood control project would increase the downstream damages from flooding at potential damage centers in Vermont, New Hampshire, Massachusetts and Connecticut.

### B. LAND MANAGEMENT ALTERNATIVES

#### 1. Discontinuance of Land Management Activities

Land management activities now undertaken at Union Village Dam are those operation and maintenance programs related to the functioning of the flood control project, the provision of some recreational facilities, and reforestation efforts in the vicinity of the dam.



An average of over 100,000 persons annually use the project land for recreational purposes. It is fair to assume that a large number of these visitors are fishermen, hunters, picnickers, snow-mobilers and others whose use of the small cleared areas and picnic facilities is incidental to their visits. The absence of such managed facilities, therefore, would not impair the recreational value of the area for the bulk of these persons visiting the project.

The unrestricted availability to the public of the 1,292 acres of the project area must be balanced against the likelihood that some or all of it, if it were not held in public ownership, would be unavailable for public recreational use. The feature of minimal land management for purposes adjunct, or ancillary, to the flood control activities is, therefore, important.

Implicit in any responsible land management scheme is the maintenance of environmental quality and values which are conducive to the natural and unimpaired functions of indigenous plant and animal life and to pleasurable experiences for those persons visiting the area. The avoidance of flood-induced damage to the reservoir area, or its mitigation when it unavoidably occurs, is a responsibility which the Corps will continue to meet.

## 2. Single-Purpose Versus Multiple-Purpose Management.

The expansion of recreational programs is not justified at Union Village Dam at this time. The limitations imposed by the project

area's dimensions, slopes and other physical features do not permit development of intensive-use facilities which are also compatible with present uses. Neither is there an apparent demand for major changes in recreational use of the project area.

Inclusion of expanded forestry management programs which emphasize the utilization of timber resources should be considered. Such forestry programs would not be incompatible with present uses and could be conveniently integrated with those activities intended to enhance the aesthetic and other environmental values in the area.

## VI. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

### A. SOCIO-ECONOMIC EFFECTS

#### 1. Flood Control Benefits and Costs

Union Village Dam, constructed in 1950, is one of a number of structures built after serious floods in 1927, 1936 and 1938 hit various parts of the Connecticut River Basin. Damages prevented by Union Village Dam since 1950 have been calculated from all downstream hydrological and flood flow statistics since 1950 and assigned to the Union Village structure based on its proportional effect on flood stages. These benefits, as calculated in dollar values for past events and for statistically projected future events, are the prime justification for the existence of the dam and reservoir at Union Village.

Irreversible commitment of resources represented by the construction of Union Village Dam precludes their utilization by future generations. Not only are the physical resources a part of this commitment but so also are the opportunity costs of alternative flood control strategies, such as flood plain zoning, and the increased losses or damages stemming from unwise development on flood-prone lands due to a false or unwarranted sense of security. Costs of this latter sort are extremely difficult to assign. Also difficult to assign are those environmental damages which are principally aesthetic and stem from the occasional flooding of the reservoir area.

## 2. Recreational Benefits and Costs

Preservation of 1,292 acres of fee-owned land within the project area is a significant contribution to the public recreational potential in the region. Dispersed activities such as fishing, hunting, hiking, and snowmobiling, that are compatible with the area's resources, constitute most of this recreational potential and use. In this sense short-term uses of these resources do not preclude the maintenance of long-term recreational and environmental values.

Inclusion of a recreational pool behind Union Village Dam has in the past been considered, but implementation of such a plan has been delayed pending mitigation of water quality problems in the watershed upstream from the project area. Should the decision to proceed with

this plan be made at some later date, in response to both the demand for such a facility and the accomplished solution of the water quality problem, the loss of a stream environment and its associated recreational and other values would have to be balanced against the benefits derived from the pool.

## B. BIOLOGICAL COMMUNITIES AND ECOSYSTEMS

### 1. Changes in Land Use

Any consideration of changes in land use which have occurred as a result of the construction and operation of Union Village Dam must include those changes downstream in the Connecticut River Basin, even as far away as the State of Connecticut.

The encroachment upon natural flood storage areas may be encouraged by the provisions of upstream flood protection devices. Flood frequencies and flood stages at downstream points have been modified incrementally with the completion of each upstream flood control dam, thus publicly justifying the occupation and development of flood-prone land. Such encroachment has often been at the expense of either agriculturally productive land or ecologically valuable wetlands, the latter providing nutrients for organisms low in the food chains of plants and animals.

### 2. Modification of Stream Flows

The Ompompanoosuc River flows unimpeded through the Union Village Dam except during times of flood. In flood periods, releases are modified, if possible, to conform with safe channel capacities downstream

and to avoid synchronization with flood crests on the Connecticut River. Such modification of flow is compatible with both the short-term and most long-term downstream uses of productive resources.

## VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES INVOLVED IN THE OPERATION AND MAINTENANCE PROGRAM

### LOSS OF NATURAL RESOURCES DUE TO PERIODIC FLOODING

Aside from those indirect losses of resources occasioned by the irreversible changes in land use on downstream flood plains the focus of concern is on those resources to be found within the Union Village Reservoir where periodic flooding by impounded waters occurs.

Since the project was constructed, the reservoir has been filled to cover as many as 460 acres of land outside of the river channel and twice in less than 20 years the waters have covered an area of more than 350 acres. Less serious inundations occur almost annually. Such periodic inundations, as well as those anticipated in the future, have begun an intractable and irreversible change in the species association of plants within the floodable area. Successional changes are interfered with, as are other elements in the natural ecosystem. These changes will occur most quickly and be most severe in the lowest areas of the reservoir.

There has been some unmeasured interference in the natural habitat of both warm-water and cold-water species of fish. This interference is admittedly of short duration during the brief periods of impoundment and release.

## VIII: COORDINATION WITH OTHER AGENCIES

Coordination with various Federal, State and local interests resulted in valuable input to this assessment. Both meetings and correspondence proved to be very helpful. Following is a list of those interest groups with whom coordination took place:

U.S. Fish and Wildlife Service

Vermont Fish and Game Department

Vermont Agency of Environmental Conservation

Two Rivers Regional Planning and Development Commission


Upon evaluating the material presented in this Environmental Assessment, it is my belief that continued operation, maintenance and management of the Union Village Dam Flood Control Project is in the best public interest. To discontinue operation of this project could cause serious flooding downstream of the dam with significant property damage. Public recreation opportunities provided at the project would also be lost if management of the area ceased.

Environmentally, the operation, maintenance and management of Union Village Dam has only a minor impact. The downstream aquatic and terrestrial ecosystems have been altered somewhat due to reduced natural flooding. Impoundment of flood waters in the reservoir has minimal effects of fish reproduction, wildlife habitat and vegetation since the duration of inundation is usually rather short and often at non-critical times of year.

Therefore, since the environmental impacts of continued operation, maintenance and management of the Union Village Dam Flood Control Reservoir are minor, a formal environmental statement is not required under the provisions of the National Environmental Policy Act of 1969.

It is my opinion that the public will best be served by continuing operation of Union Village Dam.

1 Nov 76  
(date)

  
RALPH T. GARVER  
Colonel, Corps of Engineers  
Acting Division Engineer